CLAIMS

What is claimed is:

1. A method for monitoring diffraction while recording a hologram, comprising:

generating a source beam;

generating a data beam by projecting a first component of the source beam through a data source, the data beam having a first polarization;

generating a reference beam by adjusting a polarization of a second component of the source beam to provide a second polarization;

recording a hologram in a holographic medium from an interference between the data beam and the reference beam; and

measuring an offset component in an output arm of the data beam.

2. A method as claimed in claim 1, further comprising:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam; and

determining a diffraction efficiency from the output power and the input power.

3. A method as claimed in claim 2, further comprising: monitoring the diffraction efficiency to determine a termination condition for recording the hologram.

4. A method as claimed in claim 1, further comprising:

determining an output power from the offset component; and

monitoring the output power from the offset component to determine a stability condition for recording the hologram.

5. A method as claimed in claim 1, wherein the act of measuring the offset component in the output arm of the data beam includes:

splitting the offset component from the output arm of the data beam to form an offset beam; and

detecting the offset beam.

6. A method as claimed in claim 1, wherein the act of generating the data beam includes: adjusting a polarization of the first component of the source beam to provide the first polarization.

7. A method as claimed in claim 1, wherein the second polarization differs from the first polarization by a small rotation.

8. An apparatus for recording a hologram, comprising:

a laser for generating a source beam;

a beam-splitter for splitting the source beam into components including a first component and a second component;

a data-beam source for generating a data beam by projecting the first component of the source beam through a data source, the data beam having a first polarization;

a reference-beam source for generating a reference beam by adjusting a polarization of a second component of the source beam to provide a second polarization;

a holographic medium for recording a hologram from an interference between the data beam and the reference beam;

a polarizing beam splitter for separating an offset component from an output arm of the data beam; and

a detector for measuring the offset component.

9. An apparatus as claimed in claim 8, further comprising a monitoring unit for:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam; and

determining a diffraction efficiency from the output power and the input power.

10. An apparatus as claimed in claim 9, wherein the monitoring unit further includes operations for monitoring the diffraction efficiency to determine a termination condition for recording the hologram.

11. An apparatus as claimed in claim 8, further comprising a monitoring unit for:

determining an output power from the offset component; and

monitoring the output power from the offset component to determine a stability condition for recording the hologram.

12. An apparatus as claimed in claim 8, further comprising:

a polarizing beam splitter for splitting the offset component from the output arm of the data beam to form an offset beam; and

a detector for detecting the offset beam.

13. An apparatus as claimed in claim 8, wherein the data-beam source adjusts a polarization of the first component of the source beam to provide the first polarization.

14. An apparatus as claimed in claim 8, wherein the second polarization differs from the first polarization by a small rotation.

15. A method for monitoring diffraction while reading a hologram, comprising:

illuminating a holographic medium with a reference beam to generate a data beam for a hologram that has been recorded at a set diffraction efficiency with a first polarization, the reference beam having a second polarization; and

measuring an offset component in an output arm of the data beam.

16. A method as claimed in claim 15, further comprising:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam; and

determining a diffraction efficiency from the output power and the input power.

17. A method as claimed in claim 16, further comprising: monitoring the diffraction efficiency to determine a validation condition for reading the hologram based on the set diffraction efficiency.

18. A method as claimed in claim 15, further comprising:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam;

determining an estimated output power from the set diffraction efficiency and the input power; and

monitoring the output power from the offset component to determine a positioning condition for reading the hologram based on the estimated output power.

19. A method as claimed in claim 18, further comprising:

adjusting the reference beam based on the positioning condition.

20. A method as claimed in claim 18, further comprising:

adjusting the holographic medium based on the positioning condition.

21. A method as claimed in claim 15, further comprising:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam;

determining an estimated output power from the set diffraction efficiency and the input power; and

monitoring the output power from the offset component to determine a hologram type based on the estimated output power.

22. A method as claimed in claim 21, further comprising:

calibrating the input power based on the hologram type.

23. A method as claimed in claim 21, further comprising:

calibrating the output power based on the hologram type.

24. A method as claimed in claim 15, wherein the act of measuring the offset component in the output arm of the data beam includes:

splitting the offset component from the output arm of the data beam to form an offset beam; and

detecting the offset beam.

25. A method as claimed in claim 15, wherein the second polarization differs from the first polarization by a small rotation.

26. An apparatus for reading a hologram, comprising:

a holographic medium including a hologram that has been recorded at a set diffraction efficiency with a first polarization,

a reference-beam source for illuminating the holographic medium with a reference beam to generate a data beam corresponding to the hologram, the reference beam having a second polarization;

a polarizing beam splitter for separating an offset component from an output arm of the data beam; and

a detector for measuring the offset component.

27. An apparatus as claimed in claim 26, further comprising a monitoring unit for:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam; and

determining a diffraction efficiency from the output power and the input power.

28. An apparatus as claimed in claim 27, wherein the monitoring unit further includes operations for monitoring the diffraction efficiency to determine a validation condition for reading the hologram based on the set diffraction efficiency..

29. An apparatus as claimed in claim 26, further comprising a monitoring unit for:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam;

determining an estimated output power from the set diffraction efficiency and the input power; and

monitoring the output power from the offset component to determine a positioning condition for reading the hologram based on the estimated output power.

30. An apparatus as claimed in claim 29, further comprising: an adjustment unit for adjusting the reference beam based on the positioning condition.

31. An apparatus as claimed in claim 29, further comprising: an adjustment unit for adjusting the holographic medium based on the positioning condition.

32. An apparatus as claimed in claim 26, further comprising a monitoring unit for:

determining an output power from the offset component;

determining an input power corresponding to an input arm of the reference beam;

determining an estimated output power from the set diffraction efficiency and the input power; and

monitoring the output power from the offset component to determine a hologram type based on the estimated output power.

33. An apparatus as claimed in claim 32, further comprising: an adjustment unit for adjusting an input power of the reference beam based on the output power of the offset component and the hologram type.

34 An apparatus as claimed in claim 26, further comprising:

a polarizing beam splitter for splitting the offset component from the output arm of the data beam to form an offset beam; and

a detector for detecting the offset beam.

35. An apparatus as claimed in claim 26, wherein the second polarization differs from the first polarization by a small rotation.